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ABSTRACT

The development of certain cognitive skills to a certain level may be necessary to acquire beginning reading skills. A review of research on cognitive skill development and beginning reading revealed that only a few studies investigated the need for ascertaining the presence of some cognitive processing abilities before reading instruction is attempted. The cognitive skills that have been identified as relevant to reading are (1) perceptual and cognitive decentration, (2) conservation, (3) classification and class inclusion, (4) seriation, and (5) cognitive synthesis. A prereader should reach a point where these skills can be exercised on material that is presented only verbally or symbolically. In the case of remedial readers, lack of reading skills may be due not just to a lack of development of those skills specific to reading, such as word recognition, but to a lack of development of more basic cognitive or thinking skills. In a study to determine whether classification skills had developed to the same extent in adults who had reading problems as they had developed in adults who were normal readers, the results indicated that the normal readers were much more adept at classification tasks. Thus, it appears that a deficiency in acquiring certain cognitive skills can hamper reading and general literacy skills. (AEA)

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Cognitive development and the acquisition of reading skills.

Is thinking important for reading? Is reading important for thinking? It has been proposed (Waller,1977) that operational thought and perceptual decentration are necessary for successful reading acquisition, and that formal operational intelligence is necessary for the comprehension of adult-level reading material. It has further been proposed (Olson,1975,1977) that literacy and education push cognitive growth, by helping the emergence of general mental capacities like abstract thinking. But should we look for the presence of some cognitive processing abilities before attempting instruction in reading skills? This paper reviews research on aspects of thinking which have been found to be related to beginning reading. It then looks at the results of remedial instruction which has/has not taken this aspect into account. Finally, findings are presented from the writer's own research with adult literacy students which suggest that there is an important relationship between cognitive development and reading skill. The consequences for priorities in tuition are discussed.

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COGNITIVE DEVELOPMENT

AND THE ACQUISITION OF READING SKILLS

Definitions of reading range from simple definitions of it as simply a decoding process, to more complex definitions involving all the past experiences of the reader, his sensory-motor functioning, his motivation, expectations, attention, cognitive and memory skills. It is generally accepted now that reading is not just a visual process, but that it involves the interaction of information which the reader receives through the visual system with information which he already has available. The ability to bring together different items of information in a flexible constructive way has been suggested as important for reading by some writers (Moyle, 1976; Reid, 1973). Reid proposes that 'integrating' skills may be of underlying importance in that even during the early stages of learning to read, the learner has to do a great many things at the same time. This is especially true when the method of teaching makes use of the child's oral language competence for he is then asked to fuse information from many different sources demanding the development and use from the very beginning of integrating or cognitive skills.

The questions I wish to consider in this paper are as follows:

i) Which cognitive skills are relevant here, and have been identified in the literature?

ii) What conditions are necessary for their development?

iii) In what way are they relevant for reading - what evidence have we of their importance? - considerations of remedial results and of findings in adult literacy students will be significant here.

i) Cognitive skills which have been identified as relevant to reading.

On the whole, research in this area has been along Piagetian lines and it has been reviewed by Waller (1977). The skills which have been picked up as being important are as follows:

a) Perceptual and cognitive decentration, or the ability to take into account and simultaneously coordinate several dimensions in a situation (e.g. finding a hidden figure in a set of ambiguous figures).

b) Conservation - or realising that a lump of clay contains the same amount of clay no matter what shape it is pressed into; knowing that ten beads will still be ten beads no matter how they are arranged; knowing that the amount of milk in a pint bottle will remain the same if it is transferred to a litre bottle.

c) Classification and class inclusion skills - sorting blocks varying in colour, size and shape according to various classification schemes. This would include knowledge of 'some' and 'all', and of multiple class membership. (A green block could belong to the green group, to the cube group and to the large group etc.)

d) Seriation - awareness of order and a notion of one to one correspondence.

e) Cognitive Synthesis or the ability to put meanings together and to make them result in an action.

ii) Conditions necessary for their development.

In naming the skills I have given examples of their use by the prereading child who is still at Piaget's preoperational stage. At this stage, the child should have opportunities to actively manipulate his environment, thus laying the foundation for subsequent cognitive development. But these kinds of activities are not sufficient in themselves to develop cognitive skills to the point where they may be useful in reading. What has to be aimed for is the development of the symbolic function, or the ability

to use these skills and explain the actions involved without being limited to concrete materials. In other words the child should come to the point where he can exercise these skills on material which is presented only verbally and symbolically to him.

The essential is probably the ability to distinguish a signifier from that which is signified - or to let something stand for or represent something else while differentiating the two somethings. The symbolic function permits the word bus, or a picture or a model of a bus, or even the sound of a bus, to stand for or represent the real thing which might not be present in the immediate environment. It allows operations using the signifier. Without symbolic function a squiggle on the page will never represent anything else and grasp of this notion is particularly important in reading and writing since print is truly arbitrary and symbolic.

iii) Relevance of these skills for reading.

a) Decentration: Elkind (1974) has done systematic investigations of the relationship between perceptual development and reading. The results reported provide moderate support for the role of perceptual regulations in reading. Training on exercises emphasising completion of ascending and descending series, anagram and scrambled word solutions, symbolic transformations, coding and the completion of a series of tenses and plurals was expected to have enhanced the development of the various perceptual regulations. These included exploration, transport and reorganisation and they enable the reader to explore systematically the printed page, compare visual stimuli separated by space and time, and schematise the letters as words and the words as phrases and sentences. But in the work reported it is impossible to tell how specific the relationship was between the stimuli used in the training exercises and

those present in the recognition subtests. This is particularly important since the training benefits were limited to recognition performance. However, by matching for intelligence these researchers did attempt to show that there is a decentration factor involved in reading and that it is different from intelligence. They also showed that decentration training improves at least the recognition aspect of reading performance. This represents a beginning, but replication and extension are obviously needed in this area.

b) Conservation: Reading would seem to use the same skills as conservation as it involves holding a system in mind while transformations are made. Transformed states must then be compared to the original. The letter a for example can be written in several different ways, but it is always called a. No matter how it is written, it can have varying sounds, depending on its position in the word, and on the letters following it, and still it is called a. On a broader level, in some cases word order can be changed without changing meaning (the boy hit the cat: the cat was hit by the boy); but in other cases a change of word order can also mean a change of meaning (the boy hit the cat: the cat hit the boy). On the whole the studies which have investigated the relationship between conservation and early reading acquisition have found it to be positive if low, but also consistent across sex and social class. In general too, correlations have been reduced somewhat when mental age is partialled out. Results in this area are not very conclusive as yet.

c) Classification : Intuitively, classification skills would seem to be relevant for reading. A word can be a word and a noun or a verb at the same time. A word is an element in a class, and at the same time it, in itself, contains parts. We also have to consider a set of items called letters, and these letters consist of vowels and consonants (a letter is a letter, and at the same time it is a vowel or a consonant).

The development of higher order units of structure will also depend on part-whole and class-element relationships and on the capacity to learn multiple correspondences. In addition, the development of classification skills would be important for learning because the retrieval of information from memory will be dependent on the way in which it is organised. Reading acquisition is one area of learning which requires the generation, reorganisation and classification of information. In reading, a child must for example shift from a reliance on recognising words in a particular context to noticing that letter formation and order are alternative forms of recognition. The results of a study by Mason (1977) showed that word learning was related to the ability to reorganise a set of symbols. Other studies too have found aspects of beginning reading to be correlated significantly with operativity or the ability to impose structure on incoming information. In general, results from studies of the relationship between performance in reading and classification have indic ted that this is a positive one and that poor readers appear to function at a preoperational level.

d) Seriation: At the most obvious level, oral reading requires serial correspondence between print and sound: the first word is given the first sound or set of sounds, the second word the next, and so on down the line of print and down the set of lines in serial order with proper concern for spatial relationships. Competence in seriation would also be necessary in order to dissect and reassemble words. Correlations between reading readiness test results and a seriation task were found to be strikingly high by Scott (1969) at .82. In a study by Kaufman and Kaufman (1972) the correlation between seriation and reading at .55 was higher than that between reading and mental age (.51) and also higher than that between reading and IQ (.49). These results suggest that this

aspect of cognitive functioning may be important particularly at the early reading stage.

e) Cognitive synthesis: Research in this area, which seems promising, has been reported by Farnham-Diggory (1967) and by Denner (1970). The basic experiment involved four tasks at levels of increasing sophistication.

i) Action - the child was asked to act out a series of verbal commands such as 'show me how you can jump'.

ii) Discrimination - the child was shown drawings and taught labels for them - a stick-man walking was labelled 'walk'

iii) Learning - the child was taught logographs, or whole-word symbols drawn on cards; a checkmark rotated 180° meant 'jump' for example.

iv) Synthesis - the child was asked to act out sentences represented by logographs in combination - jump over block; walk around block.

In the first experiment it was found that only when children reached the age of six or seven could they perform the synthesis task satisfactorily. In another study (Denner, 1970) when the tasks were administered to groups of good and poor readers of different ages it was found that the good readers were superior to poor readers of the same age, and that they were superior also to older problem readers on the synthesis task, but not on the other three.

Perhaps the coordination of elements or relations as is required in this task and also in reading may be the basis of the relationship between the two activities, but it is not clear from the research reported so far whether this is a causal relationship, nor which ability might precede the other.

It would seem however, that reading requires a number of very basic skills, skills even more basic than discriminating letters and attaching letters to sounds and sounds to letter combinations. In the case of

problem or poor readers, it may be that training in these more basic skills is needed as much as in word recognition techniques. This possibility is supported, it seems to me, by what we know of the results of remedial teaching. I may be out of date here, but surveys of remedial teaching which I have seen (Chazan, 1967; Cashdan, 1970; Carroll, 1972, Cockburn, 1973) suggest the following:

a) remedial teaching, where we have evidence about what it consists of, seems to be based on a functional model of diagnosis - looking for points in the explicit reading process when breakdown occurs and teaching to overcome these breakdowns;

b) short-term gains, mostly in word recognition skills are often found as a result of remedial teaching;

c) in the long-term, the rapid progress made during remedial teaching is not maintained, and children who received remedial teaching tended to slip back to the level of children who had not received it although they were in need of it ;

d) the word-recognition skills which had improved were not found to transfer or generalise, indicating that the improvement seemed to lie only in the mechanical aspects of word recognition ;

It would seem likely that misdiagnosis or inadequate diagnosis with consequent inappropriateness of treatment may be largely responsible for the lack of significant and lasting gains in many children. It is true that the affective dimension has rarely been taken into account in these studies, and it would certainly be an avenue worth exploring. But for the present paper I wish to draw attention to the possibility that in many cases, lack of reading skills may be due not just to lack of development of those skills specific to reading, but to lack of development of the more basic skills which underlie those skills used in reading, the cognitive or thinking skills.

It is usually assumed that these skills develop by themselves and that they do not need extra attention, but we have in fact little evidence either way on this. It is further assumed that everyone in the same culture will eventually attain the same level in these skills, but the use of corss-sectional data, as is common, to describe a course of longitudinal development, may be fallacious (Kofsky,1966) , for the existence in a younger group of gaps in performance which are filled in by an older group may not be suitable evidence on the normal course of development, since there is no guarantee tha the younger group when older will perform as the older group did.

As we have seen above, classification skills have been found to correlate with early reading achievement. It seems likely then, that adults who failed to learn to read as children, were also slower to develop classification skills. I decided to investigate whether classiiication skills had in fact developed in adults who still had reading problems to the same extent as they had developed in adults who were normal readers.

The focus of the study was on the use of general superordinate grouping strategies which group items on the basis on one or more attributes common to all. The subjects were adult literacy students (N = 20) in the Belfast area, all male, in full employment of a skilled or semiskilled nature, and within the average range of intelligence as measured by the WAIS Performance scale. Another group of men, all normal readers, of similar age (25 - 45 years), employment and IQ who were attending classes in connection with their employment, performed the same tasks. The test was the Associative Grouping Test (Bruner,1962). The materials were composed of nine sequentially presented nouns, first spoken aloud and then presented written on cards and laid on the table one at the time. The subjects were shown the first two words together

and were asked to say how they were alike. As subsequent words were added they were asked to state how they were different and then how they were like all the preceding words. A second sequence of nouns was administered in the same way. The responses were taped on audio tape and transcribed later.

Results showed that the normal readers used significantly more superordinate concepts than did the adult literacy students on both sequences of nouns. Correlations with IQ were not significant for either group. It would seem therefore that the adult literacy students, who had probably been deficient in developing classification skills as children, had not developed the facility of transforming information in this way to the same extent as normal readers even when they were adult. It could be argued that this may have been due to their lack of literacy skills, which might have stimulated and assisted this kind of development. But other research has suggested (Mason,1977, Waller,1977) that the development of some cognitive skills may be necessary to a certain level, even in order to acquire beginning reading skills and that these are deficient in children who have problems with reading at that stage.

It would seem then that a lag in this area may precede the acquisition of reading and general literacy skills and that this lag is not inevitably overcome. Whether it can be overcome by instruction we do not yet know, and whether the other skills I mentioned - decentration, conservation, seriation and cognitive synthesis - fall into the same category, we don't yet know, but it would appear that this is an area where research and experiments may well be very fruitful.

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